

## INTERNET COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 18 October 2000 (18.10.00)	
International application No. PCT/EP00/01514	Applicant's or agent's file reference EUR 50755/WO
International filing date (day/month/year) 24 February 2000 (24.02.00)	Priority date (day/month/year) 17 March 1999 (17.03.99)
Applicant BLEYS, Gerhard, Jozef et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

07 September 2000 (07.09.00)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

R. E. Stoffel

Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BAKEN, Philippus, Johannes,  
Leonardus, Henricus  
Huntsman ICI Europe Ltd.  
Huntsman Polyurethanes  
Intellectual Property Dept.  
Everslaan 45  
B-3075 Everberg  
BELGIQUE

Date of mailing (day/month/year) 23 April 2001 (23.04.01)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference EUR 50755/WO	
International application No. PCT/EP00/01514	International filing date (day/month/year) 24 February 2000 (24.02.00)

## 1. The following indications appeared on record concerning:

☒ the applicant      ☐ the inventor      ☐ the agent      ☐ the common representative

Name and Address HUNTSMAN ICI CHEMICALS, LLC 500 Huntsman Way Salt Lake City, UT 84108 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person      ☒ the name      ☐ the address      ☐ the nationality      ☐ the residence

Name and Address HUNTSMAN INTERNATIONAL LLC 500 Huntsman Way Salt Lake City, UT 84108 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 3. Further observations, if necessary:

## 4. A copy of this notification has been sent to:

☒ the receiving Office      ☐ the designated Offices concerned  
☐ the International Searching Authority      ☒ the elected Offices concerned  
☒ the International Preliminary Examining Authority      ☐ other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer C. Cupello
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BAKEN, Philippus, Johannes,  
Leonardus, Henricus  
Huntsman ICI Europe Ltd.  
Huntsman Polyurethanes  
Intellectual Property Dept.  
Everslaan 45  
B-3075 Everberg  
BELGIQUE

Date of mailing (day/month/year) 27 March 2001 (27.03.01)	<b>IMPORTANT NOTIFICATION</b>
Applicant's or agent's file reference EUR 50755/WO	
International application No. PCT/EP00/01514	International filing date (day/month/year) 24 February 2000 (24.02.00)

## 1. The following indications appeared on record concerning:

☒ the applicant    ☐ the inventor    ☐ the agent    ☐ the common representative

Name and Address HUNTSMAN ICI CHEMICALS, LLC 500 Huntsman Way Salt Lake City, UT 84108 United States of America	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☐ the person    ☒ the name    ☐ the address    ☐ the nationality    ☐ the residence

Name and Address HUNTSMAN INTERNATIONAL LLC	State of Nationality US	State of Residence US
	Telephone No.	
	Facsimile No.	
	Teleprinter No.	

## 3. Further observations, if necessary:

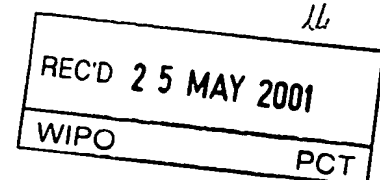
## 4. A copy of this notification has been sent to:

<input checked="" type="checkbox"/> the receiving Office	<input type="checkbox"/> the designated Offices concerned
<input type="checkbox"/> the International Searching Authority	<input checked="" type="checkbox"/> the elected Offices concerned
<input checked="" type="checkbox"/> the International Preliminary Examining Authority	<input type="checkbox"/> other:

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	Authorized officer  C. Cupello  Telephone No.: (41-22) 338.83.38
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# PATENT COOPERATION TREATY

## PCT



### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>EUR 50755/WO</b>		<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. <b>PCT/EP00/01514</b>	International filing date (day/month/year) <b>24/02/2000</b>	Priority date (day/month/year) <b>17/03/1999</b>	
International Patent Classification (IPC) or national classification and IPC <b>C08G18/48</b>			
Applicant <b>HUNTSMAN INTERNATIONAL LLC</b>			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☒ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand <b>07/09/2000</b>	Date of completion of this report <b>22.05.2001</b>
Name and mailing address of the international preliminary examining authority:  <b>European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465</b>	Authorized officer <b>Krätzschmar, U</b> Telephone No. +49 89 2399 2137 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01514

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-16 as originally filed

**Claims, No.:**

1-15 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/01514

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## IV. Lack of unity of invention

1. In response to the invitation to restrict or pay additional fees the applicant has:

- ☐ restricted the claims.
- ☐ paid additional fees.
- ☐ paid additional fees under protest.
- ☐ neither restricted nor paid additional fees.

2. ☒ This Authority found that the requirement of unity of invention is not complied and chose, according to Rule 68.1, not to invite the applicant to restrict or pay additional fees.

3. This Authority considers that the requirement of unity of invention in accordance with Rules 13.1, 13.2 and 13.3 is

- ☐ complied with.
- ☒ not complied with for the following reasons:  
**see separate sheet**

4. Consequently, the following parts of the international application were the subject of international preliminary examination in establishing this report:

- ☒ all parts.
- ☐ the parts relating to claims Nos. .

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-15
	No: Claims
Inventive step (IS)	Yes: Claims 1-12
	No: Claims 13-15
Industrial applicability (IA)	Yes: Claims 1-15
	No: Claims

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/EP00/01514

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2. Citations and explanations  
**see separate sheet**

**Ad section IV.:**

The subject-matter of claims 1-12 and 13-15 is not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons: The process according to claims 1-12 involves the application of an external mould release agent and the presence of a specific polyether polyol in the reaction mixture. In contrast thereto, claim 13 refers to a moulded polyurethane (PU) foam which is solely characterized by parameters such as the density, vibration transmissibility, resonance frequency etc.

**Ad section V.:**

1. Reference is made to the following documents:

D1: EP-A-547 765 (not cited in the search report, but in the application itself)

D2: WO-A-98/00450

D3: WO-A-97/21750.

2. Novelty can be acknowledged for the subject-matter of present claims 1-15 (Art. 33(2) PCT). Documents D1 to D3 do disclose the use of the specific polyether polyol according to present claim 1, but not in connection with a process wherein an external mould release agent is applied. The foams according to claims 13-15 of the application seem to have a different density than those of D1 - D3: The foams according to the examples in D1 show a free rise density of 23-39 kg/m<sup>3</sup> which is below the claimed range of 55-150 kg/m<sup>3</sup>. In contrast thereto, the foams according to D2 and D3 have a higher density (see D2: page 4, line 32 - p.5/l.2 and table 1; D3: examples 1-4 in table I).
3. The subject-matter of claims 1-12 is also considered as involving an inventive step (Art. 33(3) PCT). D1 to D3 do not suggest that the use of a polyether polyol having a high oxyethylene content of at least 50% by weight results in a reduction in the number of times the external mould release agent needs to be applied (see Example 1: 52 consecutive mouldings without renewal of the release agent).



4. However, the subject-matter of claims 13-15 does not involve an inventive step for the following reasons.

The foam according to claim 13 is defined by a number of parameters from which only the density and the oxyethylene content are mentioned in documents D1 to D3. The foam density therefore is the only distinguishing feature of the claimed foams (see above) since it cannot be excluded that the foams of D1 to D3 also show the additional parameters according to claim 13. This feature is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to provide further polyurethane foams.

**Ad section VIII.:**

Claim 13 does not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The claim attempts to define the subject-matter in terms of the result to be achieved which merely amounts to a statement of the underlying problem. The technical features necessary for achieving this result should be added.

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference <b>EUR 50755/WO</b>	<b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. <b>PCT/EP 00/ 01514</b>	International filing date (day/month/year) <b>24/02/2000</b>	(Earliest) Priority Date (day/month/year) <b>17/03/1999</b>
Applicant <b>HUNTSMAN ICI CHEMICALS, LLC et al.</b>		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.  
☒ It is also accompanied by a copy of each prior art document cited in this report.

### 1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing :
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

### 4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

### 5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

### 6. The figure of the drawings to be published with the abstract is Figure No.

- ☐ as suggested by the applicant.
- ☐ because the applicant failed to suggest a figure.
- ☐ because this figure better characterizes the invention.
- ☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

National Application No

PCT/EP 00/01514

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 C08G18/48 B29C33/60

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C08G B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 416 399 A (DOW CHEMICAL) 13 March 1991 (1991-03-13) page 2, line 23 -page 7, line 19 page 8, line 21 - line 32; example 15 ---	1-3
A	EP 0 180 749 A (BAYER) 14 May 1986 (1986-05-14) page 2, line 14 -page 6, line 25 page 16, line 10 -page 17, line 24; example 13 ---	1-3
A	WO 98 00450 A (IMPERIAL CHEMICAL INDUSTRIES) 8 January 1998 (1998-01-08) page 1, line 19 -page 3, line 14; claims 1,4-13 --- -/--	1

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

7 August 2000

Date of mailing of the international search report

14/08/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2  
NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

Bourgonje, A

## INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP 00/01514

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 21750 A (IMPERIAL CHEMICAL INDUSTRIES) 19 June 1997 (1997-06-19) cited in the application page 2, line 11 -page 3, line 36; claim 11 -----	1
A	EP 0 547 760 A (IMPERIAL CHEMICAL INDUSTRIES) 23 June 1993 (1993-06-23) cited in the application page 2, line 15 -page 3, line 27; claims 1-3; examples -----	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/01514

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 416399	A	13-03-1991	US 5070110 A	03-12-1991
			AU 6135290 A	28-02-1991
			BR 9004287 A	03-09-1991
			CA 2023979 A	26-02-1991
			JP 3106922 A	07-05-1991
			US 5162382 A	10-11-1992
EP 180749	A	14-05-1986	DE 3436163 A	10-04-1986
			AU 571112 B	31-03-1988
			AU 4749885 A	10-04-1986
			BR 8504862 A	22-07-1986
			CA 1252945 A	18-04-1989
			DE 3563214 D	14-07-1988
			ES 547490 D	16-07-1986
			ES 8609392 A	16-12-1986
			JP 1029493 B	12-06-1989
			JP 61091216 A	09-05-1986
			US 4609682 A	02-09-1986
WO 9800450	A	08-01-1998	AU 3171297 A	21-01-1998
			BR 9709988 A	10-08-1999
			CA 2258677 A	08-01-1998
			EP 0912623 A	06-05-1999
			PL 330920 A	07-06-1999
			US 5968993 A	19-10-1999
WO 9721750	A	19-06-1997	AU 718820 B	20-04-2000
			AU 7625896 A	03-07-1997
			BR 9611977 A	17-02-1999
			CA 2239482 A	19-06-1997
			CN 1208423 A	17-02-1999
			EP 0865458 A	23-09-1998
			JP 2000501756 T	15-02-2000
EP 547760	A	23-06-1993	PL 327198 A	23-11-1998
			DE 69216213 D	06-02-1997
			DE 69216213 T	15-05-1997
			ES 2095416 T	16-02-1997
			JP 5239170 A	17-09-1993
			US 5260346 A	09-11-1993



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>C08G 18/48, B29C 33/60</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/55232</b> <b>(43) International Publication Date:</b> 21 September 2000 (21.09.00)
<b>(21) International Application Number:</b> PCT/EP00/01514 <b>(22) International Filing Date:</b> 24 February 2000 (24.02.00)  <b>(30) Priority Data:</b> 99105419.8                      17 March 1999 (17.03.99)                      EP  <b>(71) Applicant (for all designated States except US):</b> HUNTSMAN ICI CHEMICALS, LLC [US/US]; 500 Huntsman Way, Salt Lake City, UT 84108 (US).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> BLEYS, Gerhard, Jozef [BE/BE]; Bremstraat 19, B-3001 Heverlee (BE). HUY- GENS, Eric [BE/BE]; Pieter De Somerlaan 3, B-3001 Hev- erlee (BE). LEENSLAG, Jan-Willem [NL/BE]; Rechttestraat 10, B-3120 Tremelo (BE). MOUREAU, Herman, Eugene, Germain [BE/BE]; Potstraat 7, B-3300 Tienen (BE).  <b>(74) Agents:</b> BAKEN, Philippus, Johannes, Leonardus, Henricus et al.; Huntsman ICI Europe Ltd., Huntsman Polyurethanes, Intellectual Property Dept., Everslaan 45, B-3075 Everberg (BE).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
<b>(54) Title:</b> PROCESS FOR PREPARING MOULDED POLYURETHANE MATERIAL		
<b>(57) Abstract</b> <p>Process for preparing a polyurethane material in a mould in which process the following steps are conducted: 1. an external mould release agent is applied onto at least those surfaces of the mould which will be in contact with the ingredients used for preparing the polyurethane material and/or the finished polyurethane material; 2. the ingredients to be used for preparing the polyurethane material are fed into the mould; 3. the ingredients are allowed to react and to form the polyurethane material; 4. the polyurethane material so formed is removed from the mould and 5. steps 2,3 and 4 are repeated at least 10 times without repeating step 1, wherein at least 25% by weight of the ingredients used to make the polyurethane material, excluding water in this calculation when used, consist of polyether polyol having a functionality of 2-6, an equivalent weight of 500-5000 and an oxyethylene content of at least 50% by weight.</p>		

**FOR THE PURPOSES OF INFORMATION ONLY**

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

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EE	Estonia	LR	Liberia	SG	Singapore		

Process for preparing moulded polyurethane material

The present invention is concerned with a process for preparing moulded polyurethane materials, in particular foams made from a considerable amount of a polyol having a relatively high oxyethylene (EO) content.

EP 547765 discloses the preparation of flexible foams using a considerable amount of a polyether polyol containing a considerable amount of oxyethylene groups. In general terms the making of mouldings has been disclosed.

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WO 97/21750 discloses the preparation of moulded elastomers using the same type of polyols in high amount.

15

US 5700847 and US 5668191 disclose the preparation of moulded flexible foams as well.

None of these citations touches upon a problem encountered in making such moulded foams commercially. Commercially such foams are made using moulds which have been treated before use : the surfaces, which will be in contact with the ingredients used for preparing the polyurethane material and/or with the finished polyurethane material, are provided with one or more so-called external mould release agents. After having made 5 or 6 mouldings these surfaces need to be provided with an external mould release agent again. In most cases the application of this external mould release agent onto said surfaces is conducted manually; whether it is conducted manually or automatically, this repetitive application of external mould release agent increases the cycle time and the amount of external mould release agent used. Further it has been experienced in practice that the external mould release agent during the moulding process is concentrated at certain parts of the surface of the mould (so called 'build-up'), which requires thorough cleaning of the surface regularly.

30



EP 547760 discloses a process for making moulded elastomers; more than 100 mouldings could be done without applying external mould release agent. The reaction systems used comprise allophanate-modified polyisocyanate and a  
5 considerable amount of a polyether polyol having a relatively high oxypropylene content.

Many disclosures have been made in the past to improve demoulding by using an internal mould release agent; see e.g. EP 119471 and EP 173888 and the prior art  
10 discussed therein.

It would be advantageous to be able to make moulded flexible polyurethane foams without the need to apply external mould release agent as often as nowadays. Further it would be advantageous to reduce the total amount of external mould  
15 release agent used when making mouldings and to reduce the build-up.

Surprisingly, we have found that it is possible to reduce the number of times external mould release agent needs to be applied, the total amount of external mould release agent used in the moulding process and the build-up by using a  
20 substantial amount of a polyol having a substantial amount of oxyethylene groups in preparing the moulded material.

Therefore the present invention is concerned with a process for preparing a polyurethane material in a mould in which process the following steps are  
25 conducted :

1. an external mould release agent is applied onto at least those surfaces of the mould which will be in contact with the ingredients used for preparing the polyurethane material and/or the finished polyurethane material;
2. the ingredients to be used for preparing the polyurethane material are fed into  
30 the mould;

3. the ingredients are allowed to react and to form the polyurethane material;
4. the polyurethane material so formed is removed from the mould and
5. steps 2,3 and 4 are repeated at least 10 times without repeating step 1, wherein at least 25% by weight of the ingredients used to make the polyurethane material, excluding water in this calculation if used, consist of polyether polyol having an average nominal functionality of 2-6, an average equivalent weight of 500-5000 and an oxyethylene content of at least 50% by weight.

10 In the context of the present invention the following terms have the following meaning :

- 1) isocyanate index or NCO index or index :  
the ratio of NCO-groups over isocyanate-reactive hydrogen atoms present in a formulation, given as a percentage :  
$$\frac{[\text{NCO}] \times 100}{[\text{active hydrogen}]} \quad (\%).$$

20 In other words the NCO-index expresses the percentage of isocyanate actually used in a formulation with respect to the amount of isocyanate theoretically required for reacting with the amount of isocyanate-reactive hydrogen used in a formulation.

It should be observed that the isocyanate index as used herein is considered from the point of view of the actual foaming process or other process in the mould involving the isocyanate ingredients and the isocyanate-reactive ingredients. Any isocyanate groups consumed in a preliminary step to produce modified polyisocyanates (including such isocyanate-derivatives referred to in the art as prepolymers) or any active hydrogens consumed in a preliminary step (e.g. reacted with isocyanate to produce modified polyols or polyamines) are not taken into account in the calculation of the isocyanate index. Only the free isocyanate

groups and the free isocyanate-reactive hydrogens (including those of the water) present at the actual reaction in the mould are taken into account.

- 2) The expression "isocyanate-reactive hydrogen atoms" as used herein for  
5 the purpose of calculating the isocyanate index refers to the total of active hydrogen atoms in hydroxyl and amine groups present in the reactive compositions; this means that for the purpose of calculating the isocyanate index at the actual foaming process one hydroxyl group is considered to comprise one reactive hydrogen, one primary amine group is considered to  
10 comprise one reactive hydrogen and one water molecule is considered to comprise two active hydrogens.
- 3) Reaction system : a combination of components wherein the  
15 polyisocyanates are kept in one or more containers separate from the isocyanate-reactive components.
- 4) The expression "polyurethane foam" as used herein refers to cellular  
20 products as obtained by reacting polyisocyanates with isocyanate-reactive hydrogen containing compounds, using foaming agents, and in particular includes cellular products obtained with water as reactive foaming agent (involving a reaction of water with isocyanate groups yielding urea linkages and carbon dioxide and producing polyurea-urethane foams) and with polyols, aminoalcohols and/or polyamines as isocyanate-reactive  
25 compounds.
- 5) The term "nominal hydroxyl functionality" is used herein to indicate the  
functionality (number of hydroxyl groups per molecule) of the polyol or  
polyol composition on the assumption that this is the functionality  
(number of active hydrogen atoms per molecule) of the initiator(s) used in

their preparation although in practice it will often be somewhat less because of some terminal unsaturation.

6) The word "average" refers to number average unless indicated otherwise.

5

The polyurethane material made according to the process of the present invention may be an elastomer, a microcellular elastomer, a thermoplastic polyurethane, an integral skin semi-rigid foam, a flexible foam or a hydrophilic foam like those of the type disclosed in EP 707607 and EP 793681. The materials made e.g. may be used as body parts in automobiles like steering wheels, arm-rests and head-rests, as shoe soles, as the foam material in automotive seating or furniture, in medical and hygienic applications like wound dressing, tampons and diapers, and in leisure products like dolls. The materials obtained have comparable physical properties irrespective of whether the material is obtained after steps 2,3 and 4 have been conducted once, 10 times, 25 times, 40 times or even more.

The moulding process may be conducted in an open mould and in a closed mould; preferably the reaction takes place in a closed mould. When the moulding process is conducted in a closed mould, the mould may be closed after step 2, and opened after step 3 or the mould may be closed after step 1 and opened after step 3; in the latter case the ingredients for making the polyurethane material are fed into the mould via appropriate inlets. The moulding may be conducted by processes known in the art like cast moulding and reaction injection moulding (RIM, including so-called structural RIM).

As said, step 2 – 4 are repeated at least 10 times without repeating step 1; preferably this is at least 15 times and most preferably at least 25 times. Although, it would be desirable that steps 2 – 4 could be repeated as many times as possible without repeating step 1, practice has shown that it may be desirable to repeat step 1, after steps 2 – 4 have been repeated a considerable number of times without repeating step 1. In general it can be said that step 1 is to be repeated when a substantial increase of the force needed to remove a moulded part is observed,

30

compared to the force needed to remove the first moulded part, to such an extent that it is to be expected that the next demoulding can not be made without damaging the part. Those involved in demoulding on commercial production lines will be able easily to determine if and when step 1 is to be repeated.

5 Although not yet needed because of deteriorating demoulding performance, it might nevertheless be desirable to repeat step 1 after a certain time period, in order to have a consistent production process. In that context it might be desirable to repeat step 1 between two shifts (of e.g. 8 hours), after 24 hours or after a week depending on the complexity of the mould. It is to be noted that an usual cycle

10 time generally is between 0.5 and 20 minutes and often between 1 and 10 minutes. Practice has shown that for flexible foams such repetition of step 1 is not necessary before 50 mouldings have been made.

The ingredients used to make the polyurethane material are known in the art.

15 As said at least 25% by weight of the ingredients, excluding the amount of water if used, consist of a polyether polyol having a number average nominal functionality of 2-6, an oxyethylene group content of at least 50% by weight and preferably of 60-90% by weight (calculated on the weight of the polyether polyol)

20 and a number average equivalent weight of 500-5000. The polyether polyol may contain, together with the oxyethylene groups, other oxyalkylene groups, like oxypropylene and oxybutylene groups.

When the polyether polyol contains other oxyalkylene groups the polyether polyol

25 may be in the form of a block copolymer, a random copolymer or a combination of block- and random copolymer. Most preferably random copolymers are used. Polyoxyethylene polyols, like polyoxyethylene glycols having a molecular weight of 1000-2000, may be used as well.

The polyether polyol most preferably is a polyoxyethylene polyoxypropylene

30 polyol having a number average nominal functionality of 2-4, a number average

equivalent weight of 750-2500 and an oxyethylene content of 60-90% by weight; most preferably the polyoxyethylene polyoxypropylene polyol is a random polyol: such polyols are commercially available, examples being Daltocel<sup>TM</sup> 442 from Huntsman Polyurethanes (Daltocel is a trademark of Huntsman ICI Chemicals LLC), Arcol<sup>TM</sup> 2580 from Lyondell and CP1421 from DOW. Mixtures of these polyols having a high oxyethylene content may be used as well.

The amount of the above polyol calculated on all ingredients used, excluding the amount of water if used, preferably is 50-90% by weight and more preferably 60-85% by weight.

The other ingredients used in making the polyurethane materials are known as such and are polyisocyanates and, in case foamed polyurethane materials are made, blowing agents. Further the following ingredients may be used as optional ingredients: further isocyanate-reactive compounds like polyether polyols of a type different from those described above e.g. polyoxypropylene polyols optionally having less than 50% and preferably less than 25% by weight of oxyethylene groups at the end of the polymer chains (so called EO-tipped polyols), polyester polyols, polyether polyamines, these compounds having a number average nominal functionality of 2-6, preferably of 2-3 and a number average equivalent weight of 500-5000, preferably of 1000-3000, and like chain extenders and cross-linkers which are isocyanate-reactive compounds having an equivalent weight below 500 and a functionality of 2 and 3-8 respectively.

Examples of such chain-extendors and cross-linkers are ethylene glycol, propane diol, 2-methyl-propane-1,3 diol, butanediol, pentane diol, hexane diol, diethylene glycol, propylene glycol, dipropylene glycol, polyoxyethylene diols and triols having an equivalent weight below 500, glycerol, trimethylolpropane, pentaerythritol, sucrose, sorbitol, mono-, di- and triethanolamine, ethylenediamine, toluenediamine, diethyltoluene diamine and polyether diamines and triamines having an equivalent weight below 500.

Still further the following optional ingredients may be used: catalysts enhancing the formation of urethane bonds like metal catalysts like tin octoate and dibutyltin dilaurate, tertiary amine catalysts like triethylenediamine and imidazoles like dimethylimidazole and other catalysts like maleate esters and acetate esters;  
5 surfactants; fire retardants; smoke suppressants; UV-stabilizers; colorants; microbial inhibitors; fillers; internal mould release agents (such agents may be used to further enhance the release of the materials made but are not essential as shown in the Examples).

10 The polyols used in making the polyurethane materials and in particular the flexible foams may comprise dispersions or solutions of addition or condensation polymers.

Such modified polyols, often referred to as "polymer polyols", have been fully  
15 described in the prior art and include products obtained by the in situ polymerisation of one or more vinyl monomers, for example styrene and/or acrylonitrile, in the above polyether polyols, or by the in situ reaction between a polyisocyanate and an amino- and/or hydroxy-functional compound, such as triethanolamine, in the above polyol.

20

The amount of dispersed polymer may range from 0.1 to 10% by weight on all ingredients. Particle sizes of the dispersed polymer of less than 50 microns are preferred.

25 During the last years several methods have been described to prepare polyether polyols having a low level of unsaturation. These developments have made it possible to use polyether polyols at the higher end of the molecular weight range since such polyols can now be prepared with an acceptably low level of unsaturation. According to the present invention polyols having a low level of  
30 unsaturation may be used as well. In particular such high molecular weight

polyols having a low level of unsaturation may be used for preparing flexible foams having a high ball rebound and resilience.

If a foamed polyurethane is made a blowing agent is used. Blowing agents known  
5 in the art may be used like hydrocarbons, so called CFC's and HCFC's, N<sub>2</sub>, CO<sub>2</sub>  
and water. Most preferably water is used as the blowing agent, optionally  
together with CO<sub>2</sub>. The amount of blowing agent will depend on the desired  
density. Those skilled in the art will be able to determine the amount depending  
10 on the desired density and the blowing agent used. When water is used the  
amount will be up to 4 times the weight of all other ingredients used. For a  
flexible foam used in car seating and furniture the amount of water will be  
between 0.8-5% by weight; for a microcellular elastomer and an integral skin  
semi-rigid foam in general up to 0.8% by weight will be used and for hydrophilic  
15 foams more than 5% by weight preferably 20-300% by weight will be used; all  
amounts calculated on the amount of all other ingredients used.

Polyisocyanates used for preparing the polyurethane materials may be selected  
from aliphatic, cycloaliphatic and araliphatic polyisocyanates, especially  
diisocyanates, like hexamethylene diisocyanate, isophorone diisocyanate,  
cyclohexane-1,4-diisocyanate, 4,4-dicyclohexylmethane diisocyanate and m- and  
20 p- tetramethylxylylene diisocyanate, and in particular aromatic polyisocyanates  
like toluene diisocyanates (TDI), phenylene diisocyanates, naphthalene  
diisocyanates and most preferably methylene diphenylene diisocyanates (MDI)  
and its homologues having an isocyanate functionality of more than two, like  
crude MDI and polymeric MDI.

25 Preferred polyisocyanates are methylene diphenylene diisocyanates selected from  
pure 4,4'-MDI, isomeric mixtures of 4,4'-MDI, 2,4'-MDI and less than 10% by  
weight of 2,2'-MDI, and modified variants of these diisocyanates containing  
carbodiimide, uretonimine, and/or urethane groups, like uretonimine and/or  
carbodiimide modified MDI having an NCO content of at least 20% by weight  
30 and urethane modified MDI obtained by reacting excess MDI and a low molecular



weight polyol (molecular weight of up to 1000) and having an NCO content of at least 20% by weight.

Mixtures of the isocyanates mentioned above may be used if desired.

The polyisocyanate may, if desired, contain dispersed urea particles and/or urethane particles prepared in a conventional way, e.g. by adding a minor amount of an isophorone diamine to the polyisocyanate.

The most preferred polyisocyanate is a polyisocyanate containing at least 65%, preferably at least 80% and more preferably at least 95% by weight of 4,4'-diphenyl methane diisocyanate or a variant thereof. It may consist essentially of pure 4,4'-diphenyl methane diisocyanate or mixtures of that diisocyanate with one or more other organic polyisocyanates, especially other diphenyl methane diisocyanate isomers, for example the 2,4'-isomer optionally in conjunction with the 2,2'-isomer. The most preferred polyisocyanate may also be an MDI variant derived from a polyisocyanate composition containing at least 65% by weight of 4,4'-diphenylmethane diisocyanate. MDI variants are well known in the art and, for use in accordance with the invention, particularly include liquid (at 25°C) products obtained by introducing uretonimine and/or carbodiimide groups into said polyisocyanates, such a carbodiimide and/or uretonimine modified polyisocyanate preferably having an NCO value of at least 20% by weight, and/or by reacting such a polyisocyanate with one or more polyols having a hydroxyl functionality of 2-6 and a molecular weight of 62-1000 so as to obtain a modified polyisocyanate, preferably having an NCO value of at least 20% by weight. Up to 25% by weight of another polyisocyanate may be used together with this most preferred polyisocyanate; preferred other polyisocyanates are polymeric MDI and toluene diisocyanate.

The reaction to prepare the polyurethane materials, except the hydrophilic foams, may be conducted at an NCO-index of 40-150 and preferably of 70-110. For the hydrophilic foams the NCO index may vary much wider in view of the large amount of water used.

The polyurethane materials may be prepared according to the one-shot method and the prepolymer method. According to the one-shot method the polyisocyanate, the polyether polyol having at least 50% by weight of oxyethylene groups and the other, optional ingredients are fed into the mould and  
5 reaction is allowed to take place in the mould; if desired the polyether polyol and the other, optional ingredients are premixed.

According to the prepolymer method part or all of the isocyanate-reactive compounds, except water if used, are pre-reacted with an excessive amount of polyisocyanate to prepare a urethane-containing, isocyanate-terminated  
10 prepolymer; the prepolymer so formed is reacted with the remaining isocyanate-reactive compounds and/or the water. An especially preferred embodiment of the present invention is the use of an isocyanate-terminated, urethane-containing prepolymer having an NCO value of 3-30 and preferably of 3-15% by weight in the process of the present invention, in particular when flexible polyurethane  
15 foams are made by using this prepolymer together with water. The prepolymer is an isocyanate-terminated, urethane-containing prepolymer made by reacting an excessive amount of a polyisocyanate containing at least 65% by weight of 4,4'-diphenylmethane diisocyanate or a variant thereof with a polyoxyethylene polyoxypropylene polyol having a number average nominal functionality of 2-4, a  
20 number average equivalent weight of 750-2500 and an oxyethylene content of 60-90% by weight.

The preparation of such prepolymers and the prepolymers are known in the art: see e.g. EP 547765.

25 For the avoidance of doubt, in calculating the amount of polyether polyol having an oxyethylene content of at least 50% by weight in the polyurethane material, the amount of such polyol in a prepolymer is to be taken into account as well.

When such a prepolymer is used the flexible foam is prepared by reacting the prepolymer with water and optionally with further polyether polyol having an  
30 oxyethylene group content of at least 50% by weight and optionally with further

isocyanate reactive ingredients and optionally in the presence of the described optional ingredients. The amount of water used is 0.8-5% by weight calculated on all other ingredients used. A small amount, up to 25% by weight calculated on the weight of the prepolymer, of another polyisocyanate may be used to prepare  
5 the flexible foams; preferably such other polyisocyanates are polymeric MDI and/or toluene diisocyanate.

The flexible foams may have apparent overall densities varying from 20 to 150 kg/m<sup>3</sup> (ISO 845).

10 The process may be conducted in any type of mould known in the art. Examples of such moulds are the moulds commercially used for making polyurethane furniture parts, automotive seating and automotive parts, like steering wheels, arm-rests and head-rests.

The material of the mould may be selected from those known in the art like metal,  
15 e.g. aluminium, and epoxy resin.

Step 1 of the process according to the invention may be conducted in any way known in the art. Applying an external mould release agent on the surfaces of a mould, which surfaces will be in contact with the ingredients used for making the material and/or with the material includes any way of applying such an agent to  
20 the surfaces, like rubbing, brushing, spraying and combinations thereof and applying any agent or agents intended to facilitate the later demoulding. One or more external mould release agents may be used or mixtures of external release agents.

The external mould release agents may be applied as such or as a solution,  
25 emulsion or dispersion in a liquid.

The external mould release agents, applied in step 1, may be applied in one or more stages. Any external mould release agent known in the art may be applied; examples of suitable external mould release agents are Klüberpur 41-0039 and 41-0061 (both from Klüber Chemie), Desmotrol D-10RT from Productos Concentrol

S.A., Acmosil 180 STBH from Fuller and Johnson Cire 103 from Johnson and Johnson.

Further it was surprisingly found that flexible polyurethane foams, prepared as  
5 described hereinbefore and having a relatively high density, show an  
extraordinary combination of properties. Therefore the present invention is  
further concerned with a moulded flexible polyurethane foam having an apparent  
overall density of 55-150 and preferably of 55-100 kg/m<sup>3</sup>, a vibration  
transmissibility at resonance frequency of 1.5-3.2, a resonance frequency of at  
10 most 3.5 Hz and a hardness at an indentation load deflection (ILD) of 25% of 15-  
25 kg and comprising oxyethylene and oxypropylene groups in a weight ratio of  
1:1 to 8:1 and oxyethylene groups in an amount of 25-80% by weight, calculated  
on the weight of the foam.

Preferably such foams have a resonance frequency between 2.6 and 3.4 Hz, a  
15 vibration transmissibility at 6 Hz of less than 1, preferably of 0.3-0.9, a resilience  
of at least 50% and preferably of 55-80% and an amount of oxyethylene groups of  
35-75% by weight.

The density, vibration transmissibility at resonance frequency and at 6 Hz, the  
resonance frequency, hardness and resilience are measured as follows :

20 density, kg/m<sup>3</sup> : ISO 845

vibration transmissibility at resonance frequency : JASO B407-82

vibration transmissibility at 6 Hz : JASO B407-82

resonance frequency : JASO B407-82

hardness, ILD of 25%, kg : ISO 2439:1977 (E)

25 resilience, % : ISO 8307:1990 (E)

This JASO test B 407-82 is conducted at 23<sup>0</sup>C and a relative humidity of 50%,  
using a sample of 450x450x1000 mm and an indenter of the Tekken type which  
indenter has a weight of 50 kg.

These foams preferably are prepared by using the most preferred polyisocyanates  
30 and polyols mentioned hereinbefore.

Foams having a resonance frequency below 3.5 Hz have been disclosed in EP 394487; however such foams contain a high amount of oxypropylene groups.

The present invention is illustrated by the following examples.

5

Example 1

A moulded flexible polyurethane foam was made in a metal mould (internal dimensions 30x30x7 cm). The parts of the mould which will be in contact with the ingredients for making the foam and/or with the foam were first rubbed with  
10 Johnson Cire 103 (a wax obtainable from Johnson and Johnson) and then sprayed with Klüberpur 41-0039 (an external mould release agent obtainable from Klüber Chemie).

The following ingredients were used for preparing the foam

- 15 - polyol 1 : a random polyoxyethylene polyoxypropylene polyol having a nominal functionality of 3, an oxyethylene content of about 77 % by weight and a molecular weight of about 4000;
- Suprasec<sup>TM</sup> MPR from Huntsman Polyurethanes, Suprasec is a trademark of Huntsman ICI Chemicals LLC.
- 20 - Niax A1, an amine catalyst from OSi; and
- water.

First a prepolymer was made by reacting 70 parts by weight of polyol 1 and 30 pbw of Suprasec<sup>TM</sup> MPR containing 40 ppm of thionylchloride. The prepolymer  
25 had an NCO value of 7.8% by weight.

86.7 pbw of this prepolymer and a mixture consisting of 11.8 pbw of polyol 1, 0.15 pbw of Niax A1 and 1.38 pbw of water were hand mixed in a cup (3000 rpm for 7 seconds) and this mixture was poured into the mould; total amount of the mixture was 495 grams. The mould was closed and the ingredients were allowed

to react (mould temperature 45°C). 6 minutes after closing the mould, the mould was opened and the foam was removed.

Immediately after removal of the foam and without any treatment of the mould, the same amount of ingredients (prepolymer, Polyol 1, Niax A1 and water) were  
5 poured into the mould as above, the mould was closed, the ingredients were allowed to react and the foam was demoulded after the same moulding time; this procedure was repeated 50 times. Then the experiment was voluntarily stopped. In total 52 moulded flexible polyurethane foams were made; all foams could be demoulded easily and without any damage to the foam. The foams obtained had  
10 an apparent overall density of about 75 kg/m<sup>3</sup> (ISO 845).

#### Example 2

Example 1 was repeated with the following ingredients with the proviso that the mould was used without treatment with Johnson Cire 103 and Klüberpur 41-0039;  
15 the mould was used as it was after the 52 mouldings in example 1 were made.

Ingredients :

- Suprasec<sup>TM</sup> 2010 ex Huntsman Polyurethanes
- polyol 1
- 2-methyl-propane-1,3-diol (MP)
- 20 - Dabco-DC-2 (catalyst from Air Products)

62.4 pbw of polyol 1, 6.9 pbw of MP and 0.14 pbw of DC2 were blended.

This blend was mixed as in example 1 with 30.5 pbw of Suprasec<sup>TM</sup> 2010.

Moulded materials were made as in example 1, with the exception that the mould was not closed. 16 mouldings were made without using any external mould  
25 release agent. All mouldings could be removed easily and without damage.

#### Example 3

Foams made in a similar way as in example 1 had the following physical properties :

30 Apparent overall density : 71 kg/m<sup>3</sup> (ISO 845)

Vibration transmissibility at resonance frequency : 1.99 (JASO B407-82)

Resonance frequency : 3.08 Hz (JASO B407-82)

Hardness (ILD of 25%) : 20 kg (ISO 2439:1977 (E))

Resilience : 64% (ISO 8307:1990 (E))

5 Compression set at 50%, dry : 3% (ISO 1856)

Compression set at 50%, humid : -1.7% (TSM 7100)

Vibration transmissibility at 6 Hz : 0.73 (JASO B407-82)

Claims

1. Process for preparing a polyurethane material in a mould in which process the following steps are conducted :

5

1. an external mould release agent is applied onto at least those surfaces of the mould which will be in contact with the ingredients used for preparing the polyurethane material and/or the finished polyurethane material;
2. the ingredients to be used for preparing the polyurethane material are fed  
10 into the mould;
3. the ingredients are allowed to react and to form the polyurethane material;
4. the polyurethane material so formed is removed from the mould and
5. steps 2,3 and 4 are repeated at least 10 times without repeating step 1,  
wherein at least 25% by weight of the ingredients used to make the  
15 polyurethane material, excluding water in this calculation if used, consist of  
polyether polyol having an average nominal functionality of 2-6, an average  
equivalent weight of 500-5000 and an oxyethylene content of at least 50%  
by weight.

- 20 2. Process according to claim 1 wherein steps 2, 3 and 4 are repeated at least 15 times without repeating step 1.

3. Process according to claim 1 wherein steps 2, 3 and 4 are repeated at least 25 times without repeating step 1.

25

4. Process according to claims 1-3 wherein a flexible polyurethane foam is prepared comprising reacting a polyisocyanate, the polyether polyol and water.



5. Process according to claims 1-3 wherein the ingredients comprise : 1) an isocyanate-terminated, urethane-containing prepolymer made by reacting an excessive amount of a polyisocyanate containing at least 65% by weight of 4,4'-diphenylmethane diisocyanate or a variant thereof with a polyoxyethylene polyoxypropylene polyol having a number average nominal functionality of 2-4, a number average equivalent weight of 750-2500 and an oxyethylene content of 60-90% by weight, the prepolymer having an NCO value of 3-15% by weight; and 2) water.
6. Process according to claims 4-5 wherein the amount of water is 0.8-5% by weight calculated on all ingredients used.
7. Process according to claims 4-6, wherein the amount of the polyether polyol having at least 50% by weight of oxyethylene groups is at least 50% by weight calculated on all ingredients used.
8. Process according to claims 4-7 wherein the reaction is conducted at an NCO index of 40-150.
9. Process according to claim 8 wherein the index is 70-110.
10. Process according to claims 1-9 wherein step 1 is repeated after one week.
11. Process according to claims 1-9 wherein step 1 is repeated after 24 hours.
12. Process according to claims 1-9 wherein step 1 is repeated after 8 hours.

13. Moulded flexible polyurethane foam having an apparent overall density of 55-150 kg/m<sup>3</sup>, a vibration transmissibility at resonance frequency of 1.5-3.2, a resonance frequency of at most 3.5 Hz, and a hardness (ILD of 25%) of 15-25 kg and comprising oxyethylene and oxypropylene groups in a weight ratio of 1:1 to 8:1 and oxyethylene groups in an amount of 25-80% by weight calculated on the weight of the foam.
14. Foam according to claim 13 wherein the density is 55-100 kg/m<sup>3</sup>, the resonance frequency is between 2.6 and 3.4 Hz, the vibration transmissibility at 6 Hz is less than 1, the resilience is at least 50% and the amount of oxyethylene groups is 35-75% by weight.
15. Foam according to claims 13-14 wherein the vibration transmissibility at 6 Hz is 0.3-0.9 and the resilience is 55-80%.